

P-4.7 Carry out calculations for electric power and electric energy for circuits.

Revised Taxonomy Level 3.1 C_A Execute (carry out) procedural knowledge of subject-specific skills

Key Concepts

Electric power

Electric energy

Students did not address electric power in physical science

It is essential for students to

- ❖ Understand that Power is the rate of doing work ($P = W/t$)
- ❖ Understand that electric power is the rate at which electric energy is converted into another form such as mechanical energy, heat, or light.
- ❖ Understand in an electric system
 - $P = IV$ or
 - $P = I^2R$
 - Power is measured in units of watts
 - A kilowatt is 1000 watts
- ❖ Energy is the product of power and time and is often measured in kilowatt-hours.
- ❖ Calculate the electric power and electric energy for DC and AC circuits

Traditional course differentiation

- ❖ Understand that as a volt is defined as the work per charge, (Potential difference = work/charge) ($V = W/q$)
 - work can be defined as the product of charge and potential difference ($W = qV$)
 - Current is charge per time ($I = q/t$) so $q = It$
 - So work is (current)(time)(voltage)
 $W = ItV$
 - ◆ $W/t = I V$
 - ◆ Power = current times voltage

Physics for the Technologies course differentiation

- ❖ Explain how a capacitor stores energy
- ❖ Explain the function of an inductor and how it works

Assessment Guidelines

The revised taxonomy verb for this indicator is execute (carry out), so the major focus of assessment will be for students to show that they can “apply a procedure to a familiar task”. The knowledge dimension of the indicator, procedural knowledge means “knowledge of subject-specific techniques and methods” In this case the procedure for producing an electric field drawing. A key part of the assessment will be for students to show that they can apply the knowledge to a new situation, not just repeat problems which are familiar. This requires that students have a conceptual understanding of electric charge and electric fields.